REMARKS/ARGUMENTS

Claims 34-55 are pending.

Claims 34-46 and 48-55 stand rejected under 35 U.S.C. § 103 as being unpatentable over Fischer in view of Herbst and Musgrave et al.

Claim 47 stands rejected under 35 U.S.C. § 103 as being unpatentable over Fischer in view of Herbst and Musgrave et al. as applied to claims 34-46 and 48-55, and further in view of Ingram.

These rejections are respectfully traversed and reconsideration is respectfully requested.

Claim 34 is directed to a cooling ceiling that comprises mats of cooling tubes arranged inside a sandwiched construction with upper and lower fire-resistant dry building panels. The upper and lower dry building panels are separate. Additionally, the cooling tube mats are arranged in shallow hollow cavities formed between the upper and lower dry building panels by spacers positioned between the dry building panels.

Applicants submit herewith a translation of the Fischer reference. In the previous response to the Final Rejection, the translation was separated from the response.

As one can see, the Fischer reference proposes to embed pipes into plaster board elements so that they are an integral part of the plaster board element and are not disposed in hollow cavities formed between two spaced apart upper and lower dry building panels.

Although Fischer argues that it is not difficult to incorporate such tubes in plaster board panels, in fact the opposite is the truth. It represents a completely unacceptable complication of the manufacturing system.

In contrast, a construction as recited in claim 34 has several advantages. First of all, commercially available dry building panels are used in precisely the commercially available form to construct the ceiling. This means that no special premanufactured elements are required incorporating tubes, which is the case with an arrangement such as disclosed by Fischer. Such arrangements are considered to be extremely disadvantageous in practice because the layout of a tube that is in the dry building panels is fixed and because the tubes may easily be damaged in

transit since it is essential for them to project beyond the side edges of the panels to enable connections to be made. These projections are of course extremely vulnerable to damage.

In accordance with the present invention, the cooling tube mats are separate from the dry building panels and are simply installed in which ever shallow cavities to which they are required to provide the cooling.

With the system of the present invention, all connections may be made with a whole series of panels placed together into a closed ceiling. In contrast thereto, with the Fischer system, the areas between the individual panels where the connections are made, the tubes are initially opened and a relatively complicated construction needs to be chosen to close these openings. This is very complicated, and at the end of the day, the closed-off regions will probably leave physical traces that detract from the overall appearance of the ceiling. Plastering techniques may be used but this is very messy and is precisely what one tries to avoid when using dry building panels. If plastering techniques are not used but, for example, metal panels are used to cover the joints, then there is always the question of whether condensation will occur locally on the metal and lead to deterioration of the dry building materials with damp spots and fungus appearing.

Because the cooling mats of the present invention are enclosed in spaces between dry building panels, and they themselves typically consist of plastic tubing, there is essentially no metal in the construction and the danger of condensation is much less.

Finally, it is once again respectfully submitted that the Examiner's analysis of the Fischer reference is not entirely correct. While the Examiner states that Fischer discloses all the claim features of the invention with the exception of the tubes being mats and the spacer being a plurality of spacers, in fact, because the tubes of Fischer are embedded in a composite structure, it is respectfully submitted that it is impossible to speak of spacers as discrete elements and, moreover, the composite element cannot be said to comprise upper and lower dry building panels.

It is respectfully submitted that it would not be obvious to combine the Fischer arrangement with that of Herbst or Musgrave. The Herbst arrangement involves panels of metal

on which the flexible tubes lie directly. A system such as this automatically gives rise to condensation problems making it unacceptable for use in many locations where the local atmosphere changes considerably, for example, in large stores, where shoppers, who vary in number at any one time, can produce considerable quantities of water vapor by breathing which then condenses on the metal panels on the ceiling leading to drips, stains and other unacceptable effects. Herbst does not also disclose upper and lower dry building panels. The Herbst et al reference discloses a ceiling in which pipes are draped over adjoining metal panels such as 1 in Figs. 1 and 2. These are not dry building panels in the sense of the present invention and the use of metal panels suffers the disadvantages of condensation discussed above.

The Musgrave arrangement is even less important since there the cooling pipes are encased in special coverings molded or otherwise made in a workshop from fibers, plaster or other suitable material. This is a messy, difficult to handle construction that requires a lot of labor for its production, and which is certainly also not easy to install. By forming a ceiling structure consisting of upper and lower spaced-apart dry building panels to define hollow spaces and by inserting cooling mats into these hollow spaces in accordance with the present invention as recited in claim 34, a very simple structure results with the benefits as described above.

Musgrave et al either uses a metal panel D (embodiment of Fig. 2) similar to that used in the Herbst et al reference or uses a section of fibrous plaster, which is described in connection with Fig. 1 and which has been specially molded to provide grooves or channels to accommodate pipes B, which have previously been fitted to the ceiling. This represents a horrendous effort in comparison to the simple system of the present invention and there is always the difficulty that if the pipes are not accurately mounted to the sealing then they will not accurately lie in the channels provided in the fibrous plaster. Moreover the arrangement described in Musgrave et al then requires a plastic material d2 in order to ensure some degree of heat transfer between the pipes and the fibrous plaster. It is respectfully submitted that the Examiner's assertion that Musgrave et al disclose in Fig. 2 "that it is known to have a plurality of spacers and plastic panels for the purpose of supporting and attaching the cooling plate to a building structure and obtaining a fire resistant panel" is simply wrong. The panel D in Fig. 2 is

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a metal panel and the spacers secure the metal panel to the building structure. Thus Musgrave et al do not disclose "first and second dry building panels spaced apart by spacers" as required by claim 34. Moreover the cooling tubes in Musgrave et al are attached to the ceiling not in the form of mats disposed in spaces between two dry building panels. Accordingly, one does not even obtain the combination claimed in claim 34 by combining the teachings of Fischer, Herbst and Musgrave.

Accordingly, it is respectfully submitted that neither Fischer, nor Herbst, nor Musgrave, either alone or in combination, teach, disclose or even suggest a cooling ceiling as recited in claim 34 and therefore, claim 34 is allowable.

Claims 35-54 depend, either directly or indirectly, on allowable claim 34 and therefore, they are allowable for at least the reasons claim 34 is allowable. These claims further define and augment the features of Applicant's invention.

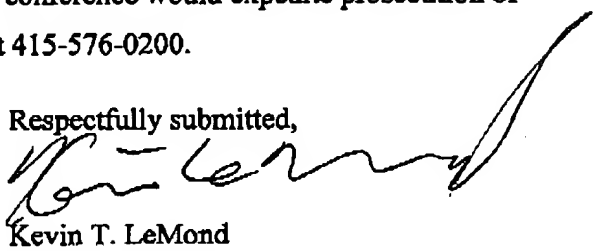
Claim 55 is an independent claim directed to a cooling ceiling comprising cooling tube mats, upper dry building panels with a thermal bearer secured thereto, the thermal bearer being attached to a lower side of the upper dry building panels, spacers that may be attached to lower side of the upper dry building panels, lower dry building panels that may be attached to the spacers in order to form hollow cavities that receive cooling tube mats, and a sound insulation that may be attached at one of either between the spacers and the upper side of the lower panels, or in a manner of a wall paper to a lower side of the lower panels. It is respectfully submitted that for the reasons discussed above, claim 55 is allowable

CONCLUSION

In view of the foregoing, Applicants believe all claims now pending in this Application are in condition for allowance and an action to that end is respectfully requested.

If the Examiner believes a telephone conference would expedite prosecution of this application, please telephone the undersigned at 415-576-0200.

Respectfully submitted,



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Translation of DE-OS 35 00 880 A

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Surface heating element in the form of a composite board.

The invention relates to a surface heating element in the form of a composite board in which at least one pipe run for a heat transporting medium is embedded into the intermediate layer lying between two outer layers.

It is known to incorporate surface heating elements into composite boards. For example a composite board is known from DE-OS 28 00 286 in which the board consists of a heat conducting layer with a cast-in pipe guide and in which the underside of the board consists of an insulation foam provided with grooves.

For an improvement of the prior art the object exists of using conventional techniques known per se in the manufacture of a surface heating element and, in contrast to other ceiling and floor heating systems, to achieve a low weight per unit area and a favourable price.

This object is satisfied in accordance with the invention by a surface heating element in the form of a composite board in which the composite board is built up in the manner of a gypsum plaster board in which the intermediate layer of hard gypsum is covered on both sides by a cardboard layer, with a tube run being embedded into the intermediate layer.

A copper tube run is preferably suitable as the tube run. It is however also possible to use plastic tubes known for this purpose, for example so-called VPE tube.

The special advantage of the invention is that the processing and manufacture of gypsum plaster boards has largely been perfected so that the incorporation of the tube run into such a board hardly impairs its processability but considerably increases its utility.

The characteristics of a gypsum plasterboard in particular, in which the outer skin works as a tensile element while the intermediate layer consists of a relatively thermal conducting material

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which can be heated up in a short period of time results, so far as surface heaters are concerned, in the great advantage that heating up is possible in a short time. The building is not loaded by the low constructional weight.

The surface heating elements in accordance with the invention can also be further improved in that the heat conducting and heat insulating characteristics of the composite board can be promoted by suitable measures. Thus it is in particular possible for the intermediate layer and/or the cardboard layer at the heat dissipating side to be provided in the region of the pipe run with heat distributing metal parts such as sheet metal panels or metal grids. In particular it is possible for the cardboard layer at the heat dissipating side to be covered at the inside and/or at the outside with a heat distributing thin metal layer or metal foil. Aluminium foil with a thickness of 0.5 to 2 mm is particularly suitable for this purpose.

Alternatively or in addition the intermediate layer can be provided at least in the region of the pipe run with a heat insulating layer, for example a foam layer in the region of the pipe run at the side opposite to the heat dissipating side.

The composition of the intermediate layer can itself be improved with respect to its thermal conductivity by the admixting of cement and/or plastics and can also be hardened in its consistency.

An embodiment of the invention is shown in the drawing.

A surface heating element in accordance with the invention is shown in the drawing. The surface heating element is constructed as a module, for example with a side length of 0.5 x 1 m or in sizes customary in trade. In its fundamental layout the surface heating element resembles so called gypsum plaster board in which the intermediate layer 2 of hard gypsum is covered on both sides by a cardboard layer 3, 4. One or more tube runs 5, 5' are embedded, depending on the requirements, into the intermediate layer 2 consisting of hard gypsum. The outer diameter of the tube amounts for example to between 6 to 10 mm with a wall thickness of 0.5 mm to 1 mm. The tube runs each end at the edges of the surface element or are lead out there in form of short stub pipes. The individual boards can be connected with the aid of connections known per se or also by soldered joints.

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The construction of the surface element can be modified in accordance with the intended purpose of use starting from the basic construction of a gypsum plaster board.

At the heat dissipating side given by the cardboard layer 4 the latter is laminated at the inner side with an apertured aluminium foil 6 so that an improved heat distribution is present and at the same time no liquid barrier arises. Instead of the aluminium foil a metal grid, for example a copper wire grid can be applied in the region of the pipe lines at the inner side of the cardboard layer 4.

At the side opposite the heat dissipating side a thin foam layer 7 can be introduced into the intermediate layer, for example of 3 mm thickness manufactured from polystyrene foam which serves for a thermal insulation in the direction towards the outer side.

Moreover, it is possible to make the hard gypsum intermediate layer 2 a better conductor by additions of cement and/or hardening plastics and at the same time to improve the hardness against indentation.

Furthermore it is possible to replace the cardboard layer at least partly by a plywood layer. It is also possible to provide the cardboard layer with a plastic lamination at the outer side. The thickness of the layer corresponds to the usual dimensions. The board itself is approximately 10 - 18 mm thick. In this connection the intermediate layer is so dimensioned that it can take up the pipe conduit with some clearance. The cardboard layer at the outer side is approximately between 0.5 and 3 mm thick.

In total a surface heating element is thus proposed which is manufactured in a simple manner, derived from known technologies, which has a low weight and with which surface heating systems can be built up in modular manner at a favourable price in diverse areas.

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Claims

1. Surface heating element in the form of a composite board in which at least one pipe run for a heat transporting medium is embedded into the intermediate layer lying between two outer layers, characterized in that the composite board is built up as a gypsum plaster board in which the intermediate layer (2) of hard gypsum is covered on both sides by a cardboard layer (3, 4), with a tube run (5, 5') being embedded into the intermediate layer.

2. Surface heating element in accordance with claim 1, characterized in that the intermediate layer and/or a cardboard layer is provided at least in the region of the pipe run (5, 5') with heat distributing metal parts such as metal sheets, foils or metal grids (6) at the heat dissipating side.

3. Surface heating element in accordance with claim 2, characterized in that the cardboard layer (4) is covered at the heat dissipating side at the inside and/or at the outside with a heat distributing thin metal layer (6).

4. Surface heating element in accordance with claim 1, characterized in that the intermediate layer consists of gypsum hardened by additions of cement and/or plastics.

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